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1834.

THE PRIZE

# TREATISE

ON THE

# MINERAL BASIN OF GLAMORGAN

AND THE

# ADJOINING DISTRICT,

AND THE

# NATIONAL BENEFITS ARISING THEREFROM.

BY

**THOMAS WILLIAM BOOKER, ESQ.**

A Medal value £3, with a Premium of £10.

> "A knowledge of our Subterranean Wealth would be the means of furnishing greater opulence to the country than the acquisition of the Mines of Mexico or Peru."
>
> SIR J. SINCLAIR.

LONDON:
LONGMAN, REES, ORME, BROWN, GREEN AND LONGMAN,
AND
WILLIAM BIRD, CARDIFF.
1834.

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# ARGUMENT OR ANALYSIS.

I. Statement, division, and arrangement of the subject.

II. Geological description of the district comprised within and surrounding the Mineral Basin of Glamorgan, &c. and also of the Minerals themselves—their position, range, and extent, and distinguishing characteristics.

III. The purposes to which the Minerals are applied:—

1st. Shipments from various Ports of the Basin—account of early and present importance of those Ports—and historic accounts of the early opening of the Mines of Great Britain.

2nd. Consumption by Works:—

- 1st. Copper Works—cursory account thereof—their produce, and the population they employ.
- 2nd. Tin Works—cursory account thereof—their produce, and the population they employ; and historical account of the Mines of Tin.
- 3rd. Iron Works—their early establishment and progressive and present importance.

IV. Extent of consumption, and durability of supply, and consequence of exhaustion of our Minerals—their national advantages and importance considered.

V. Comparative survey of the Agriculture and Commerce of the Country—necessity of their reciprocal and cordial co-operation enforced, and their mutual jealousy of each other deprecated.

VI. Statement and development of our National Resources—an exhortation to all classes in the empire to their prudent and proper application, and a summary review and application of the facts and reasoning before set forth, close the Treatise.

# TREATISE,

## &c.

In the survey which it is intended to take of the Mineral Basin of Glamorgan, and the adjoining district, it will be our first endeavour to confine our observations as much as possible within the limits which bound and circumscribe the range of the mineral treasures thrown into it,—the local characteristics of which will, in the first instance, engage our research;—this accomplished, a foundation will be laid for extended enquiry into the productions of a field of almost boundless interest: and it is hoped that "the Mineral Basin of Glamorgan, and the adjoining district," may thus be fairly developed, and "the national benefits resulting from it" may be made clearly to appear.

Dividing therefore our subject into two distinct branches, the first embracing views and considerations perhaps more immediately of local interest, while the second is of a more general and comprehensive nature, our aim will be from both to deduce considerations and conclusions of national application and importance.

It will scarcely be possible to approach our subject, except through the avenues of Geological Science: the fundamental basis of which rests on the ascertaining and fixing the order in which the materials constituting the surface of our planet, and the structure of the earth, as far as it lies open to our observation, are disposed.* This order has been fixed, and its definition rendered so exquisitely simple and natural, by a Philosopher,† whom Glamorgan claims with pride as her adopted son, that passing over the more elaborate, but far less clear and satisfactory elucidations and positions of others, who have preceded him in this elevated and intellectual branch of science, we shall adopt our own Geologist's simple and natural synoptical arrangement of those vast Formations, into which the variety of elementary substances and individual strata, composing our planet, are classified. These Formations are reduced to five in number, and are ranged in the following order:—

I. The Superior Order.
II. The Supermedial Order.
III. The MEDIAL Order.
IV. The Submedial Order.
V. The inferior Order.

The district engaging our attention belongs to the MEDIAL Order:—to the beds and measures associated in which we shall confine our attention. Their prevailing chemical character is carboniferous; within them are comprised the Coal measures, the carboniferous or Mountain Limestone, on which these measures repose, and under and beneath both the Old red sandstone, which, bounding the mineral range on all sides, forms, as it were, the crater or bowl, into which these associated beds are thrown.

Skirted by the Transition Limestone to the north and west, and partially so to the east, the Old red sandstone is spread over the counties of Hereford, Monmouth, a part of Salop, and a great part of Brecon, forming the matrix on which repose the rich and fertile soils of those highly cultivated agricultural counties. From the western extremity of Breconshire it shoots down, in a narrow isthmus, through Carmarthenshire into Pembrokeshire, near the junction of which two counties neȧr Narberth, it is intercepted by the Greywackè rocks; and it is lost to superficial view in the neighbouring St. George's Channel; appearing however again, and thrown up on the southern boundary of St. Bride's Bay, it forms those gigantic ramparts which shelter and protect Milford Haven; and thence shooting eastward under Carmarthen Bay, it forms the matrix again of the agricultural district of Gower, in Glamorganshire, running to a point into Swansea Bay, where again it is covered and concealed from view by the Bristol Channel; nor is it again visible from this point until we arrive at the head of the River Ely, near Hensol Park, where "it again emerges, forming the outer and lower chain of the mountains, into which the Coal Basin here swells. This Sandstone is probably the fundamental rock throughout the Vale of Ely, but it is concealed by overlying deposits of the newer Sandstone and Lias; it appears again in the River Taff, beyond which river it stretches through Monmouthshire, circling round the east end of the South Welsh Coal Basin, and (with the exception of a small tract near Usk, which exhibits the subjacent transition limestone) occupying the whole interval between this and the corresponding Coal Basin of the Forest of Dean."* Thrown into this Old red sandstone formation, reposing upon it, and forming a belt, as it were, and a boundary between the agricultural and mineral districts of the counties before enumerated, and through which we have traced it, the carboniferous or Mountain limestone rises to the east of Pontypool, in Monmouthshire; from thence sweeping round to the north of Merthyr Tydvil, it jets down westward into Pembrokeshire, where, with its associated bed, the old red sandstone, it is intercepted by the Greywackè rocks;—it is seen again, with the old red sandstone, on the eastern side of St. Bride's Bay, jetting through Pembrokeshire in three separate lines or belts to Carmarthen Bay, abutting on the sea at the south-western point of the bold promontory which forms the eastern rampart of Milford Haven;—again cutting across the south-western part of Glamorganshire, and abutting on the sea at the Mumbles; from thence it vanishes under the waters of Swansea Bay and the Bristol Channel, again appearing along the coast near Ogmore and Dunraven, from whence it diverges inland to Bridgend, and onwards towards Lantrissent and Caerphilly, thence sweeping in a north-easterly direction to Pontypool, and in a south-easterly direction towards the Holmes, in the Bristol Channel; being intercepted along the Glamorganshire Coast, from Penarth Point* to the river Ogmore, by the Lias and Magnesian limestones.

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* See Appendix No. 1.

† The Rev. W. D. Conybeare, A. M. &c. Rector of Sully, Glamorganshire.

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* Conybeare and Phillips's Geol. of England and Wales.

Such are the range and position of those vast formations on which the great Coal Deposit of South Wales reposes. Around this deposit in every direction the limestone crops out at the surface, except where its chain is broken, and its continuity interrupted or concealed from view by the waters of the adjacent Channel.

Thrown into this limestone, on the southern edge of the basin, are masses of Ironstone of the description termed by mineralogolists brown Hœmatite iron ore; these masses are found, to an extent hitherto unexplored, in the immediate neighbourhood of Caerphilly, Lantrissent, and Newton Down; at the latter place the ore of Iron is strongly impregnated with an alloy of Manganese. In the same edge of the limestone are also found masses of Lead ore, of the description termed Galena, the excavations in which prove that the mines of lead have been wrought to a very great extent in this district.

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* See Appendix No. 2.

Having explored the strata on which the great Coal Deposit reposes, we now approach this deposit itself; and, ascending from the limestone upwards to the coal, we pass through a space varying in depth at various parts of the Basin, within which, diffused in laminæ or beds stretching in all directions nearly parallel with the superincumbent beds of coal, are various veins and pins and balls, or nodules, of ironstone, distinguished by mineralogists by the term agillaceous or clay ironstone. These veins or seams also vary in number and thickness, and in the regularity with which they prove in different parts of the Basin; and in addition to these veins thus disposed *under* the coal, there are also other veins and pins and nodules of ironstone of a similar quality and description thrown together, and alternating with the different veins of coal; they also abound under and in connexion with the veins of Stone coal, Culm, or Anthracite. Of these several varieties or descriptions of coal, their local situations, range, and extent, it now becomes us to treat.

"The deepest part of the Basin," say the highly talented and accurate Geologists of England and Wales, "is in the neighbourhood of Neath, which is near its centre; and below Neath, or a little to the west of it, the lowest strata of coal are nearly 700 fathoms lower than the outcrop of some of the superior strata in the more hilly parts of the district. The bed of coal which is nearest to the surface lies (near Neath) about 60 fathoms beneath it, and rises to it about a mile north and south, and also a few miles east and west of the deepest part of the Basin; so that we are to imagine the inferior beds of coal rising to the surface all round the outcrop of the superior stratum, and between it and the basset edges of the limestone basin. If a line be drawn from Pontypool on the east, to St. Bride's Bay on the west, it may be said that all the beds of coal on the north of that line crop out on the north of it, at distances proportionate to their depth beneath the surface; so also those on the south of the line crop out to the south, except near Pontypool, where they rise towards the east. The inclination of the strata is much more rapid on the south edge of the Basin than on the north, being often at an angle of 45 deg. or upwards on the former, while on the north it is generally under 10 deg. On the western termination of the Basin in St. Bride's Bay, the strata exhibit the most extraordinary marks of contortion and derangement, being vertical and twisted into every possible form of contortion." This is also the case in some other parts of the southern edge of the Basin; particularly in the neighbourhood of Pyle, Cefn Cribwr, and Llantrissent, where similar marks of contortion and derangement prevail.

The veins of coal hitherto treated of are the lowest in the Basin,—they are locally and significantly termed the Line veins—they skirt the edges of the Basin, and pervade it to the extent hereafter described, and are identical and the same at the eastern, northern, and southern extremities of it; at the south-western edge they run into the sea near Briton Ferry,—at the north-western edge, after being intersected with numerous faults at and near Hirwain Common, they pass or appear metamorphosed into Stone coal, at Cwmgorellech; and the veins of stone coal, corresponding very nearly in number, thickness, position, and inclination with the bituminous veins, run down westward to Cwmgrach, and onwards through Llangafellach to Pontyrdulais and Kidwelly, and further on through Carmarthenshire into Pembrokeshire. These veins of coal vary much in number and thickness at different parts of the Basin. Where they are found all to exist, or as it is technically termed, *to prove,* they are eight in number, and together contain about 35½ feet of workable coal: the strata alternating with them are a shale or argillaceous slate, hard in its texture under ground, and smooth and soapy to the touch, but crumbling to a clay-like substance on a short exposure to the atmosphere.

The other veins of coal, which traverse the Basin, are locally termed the Rock veins. They are separated from the Line veins by a considerable thickness of rock, or coarse grit, of loose texture and abounding with specks of coaly matter. This rock is usually schistose, splitting into laminæ or layers sufficiently thin for tiles for roofing purposes and paving stones. It is technically or geologically termed *Pennant,* and it is of this rock that the summits of all the principal mountains in the interior of the Basin consist.

It is a question upon which practical as well as theoretical men are by no means agreed,—whether these veins, termed the rock veins, are or are not the same as those termed the line veins—that is, whether the former are not part and continued strata of the latter, and whether the coal, cropping out at the eastern, northern, and southern edges of the Basin, does not undulate throughout the Basin, its undulation exhibiting the strata in the interior of the Basin. We avow ourselves to be decidedly of opinion that the Rock veins are totally distinct and separated from the Line veins; that the former, reposing upon and covered by the Pennant rocks, have no connexion with the latter, which lie stretched in continuous *curved*, but not *undulating* beds, beneath them. It is from the immense resources of the rock veins that the coal, which is shipped from the various maritime ports connected with the Basin, is chiefly wrought and supplied; they also principally supply the great Copper Works of the district, while it is from the line veins that the great Iron and Tin Works of the district are chiefly supplied. The veins of Stone coal are as yet but partially wrought: their produce is however extensively shipped (principally for burning lime and drying malt, to the agricultural districts of Devon and Somerset) from the western ports of Glamorgan, Carmarthen and Pembrokeshire.

This brings us, by almost inevitable transition, to the second division of our subject. Having explored this capacious Basin, traced its mineral treasures, and described their local and distinguishing characteristics, the natural enquiry arises—are these treasurers suffered to repose undisturbed within their "bed of ages"? if not so, and if the restless energy and enterprise of man have led him to penetrate into their very inmost recesses, to what uses and purposes, whether for good or evil, is this hidden wealth of nature applied? Here wide and deep, nay boundless is the field that opens to our contemplation; but we must restrain ourselves;—and first, having emerged from the bowels of the earth, and quitted its caverns, from the height to which we have mounted, it becomes us to take our survey over those busy colonies of native industry which these mineral treasurers have called into life and activity, and to enquire what the purposes are to which these mineral productions are applied; this done, we may then be allowed to indulge in the view of contemplation which such a survey is calculated to awaken.

We have just stated that the Coal of this Basin, as an article of merchandise, is shipped from the maritime ports of the district, also that works for the production and manufacture of Copper, Tin and Iron, draw their supplies of fuel from it.

The maritime ports from whence the Coals of this Basin are principally shipped, are Newport, in Monmouthshire, and Cardiff, Neath, and Swansea, in Glamorganshire, and Llanelly, in Carmarthenshire. Without diving very deep into the Records of History, which, however inviting the subject may be, our limits (confined as we are to a treatise only) absolutely forbid our doing, yet it may be interesting to trace the early opening, and progressive strides into commercial importance which these ports have made. We will take them in the order in which we have named them, and regarding them in a commercial point of view, we may date their commercial notoriety with the commencement of the present century. Let us therefore see what they then were, and what they have since become.

The indefatigable compiler of the "Annals of British Commerce" * thus describes these respective Ports in the year 1801.

" NEWPORT—a good town near the mouth of the Usk, which makes a harbour for small vessels. Shipbuilding is the principal business of the place.

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* David Mac Pherson.

" CARDIFF—a town near the mouth of the Taff, which carries vessels of 200 tons up to it; has a tolerable harbour, and a good trade in carrying cast and wrought iron to London and other places. The Canal between Merthyr Tydvil and this place is likely to be of great service to the trade of both.

" NEATH—a thriving town about two miles from the mouth of a river of the same name, which admits vessels employed in trading to London, Bristol, &c. It has abundance of Coal, with which it supplies the adjacent counties. There are considerable Iron Forges, Smelting Houses and Works of Copper. The harbour has been lately improved, and is connected with the interior by a Canal.

" SWANSEA—a thriving town sitnate on the river Tawey, which, with the flood tide, carries vessels of 200 tons two miles above the town; has a very considerable trade in Coal, Lime, Iron, Clay, and Slag Stones, which are carried to London, Bristol, Cornwall and Ireland. There are several Copper Works, and an Iron Foundry, a Brass House, a Spelter Manufactory, a Pottery, two considerable Breweries, several Yards for Shipbuilding, and a Wet and Dry Dock. As trade and manufactures beget more trade, the merchants of Swansea have latterly extended their commerce to the Baltic and the West Indies, and it appears by the Custom-house Books that their shipping trade has increased to about five times the amount of what it was about thirty years ago, an increase of prosperity comparable to that of Liverpool. In the spirit of Liverpool, the merchants here have erected Piers for improving and deepening their harbour, and the neighbouring country is improved by a Canal. In the year

1799 there were shipped here, for London, Six Chaldrons of Coal, and to all other ports 139,486 Chaldrons of Coal, 13,319 of Stone Coal, and 19,253 of Culm.*

"LLANELLY—a town situate on an estuary of the British Channel, has a good number of vessels mostly employed in carrying coal which abounds in the adjacent country."

Such is the very accurate description, given in a work of standard authority, of these several ports as they were entitled to notice no longer ago than in the year 1801. In order to form an estimate of their comparative importance then and now, it need only, after the above description, be stated that in the year 1833, the quantity of one article alone, the produce of this Mineral Basin, viz. Coal, shipped from

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|---|---|
| Newport, was | 440,492 Tons. |
| Cardiff | 171,978 |
| Neath | 27,176 |
| Swansea | 360,000 |
| Llanelly | 59,188 |

From this statement, taken from authentic documents, it appears that the sum total of Coals shipped from the five principal ports connected with the Mineral Basin at the present time, amounts to the astonishing quantity of 1,058,834 Tons per year.

The early history of the opening of the Coal mines of this district, is involved in considerable obscurity. It is hardly to be presumed however that they were opened and wrought before the mines of Newcastle and the northern Basin; the first mention of which in the annals of our history occurs in the reign of Henry III. in the year 1245, about which time "the English," says an intelligent writer,* "providentially dissappointed in their hopes of finding very productive Mines of Gold and Silver, the nurses of national lethargy and ostentatious poverty, had begun now, and perhaps long before, to work the infinitely more valuable mines of Coal, the possession of which, together with the knowledge of the many important manufactures dependent upon them, have in later times raised the natives of Great Britain to the rank of the first manufacturing nation in the word, and given them a sufficient command of the mines of gold and silver, wrought by the slaves of those who pride themselves on being lords of the most copious mines of the precious metals, by which industry and enterprise have been banished from among themselves, while they have been animated by them among those nations who are under the happy necessity of giving valuable commodities in exchange for them."

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* The Weight of a Chaldron is 2000lbs.

Truly did the intelligent writer here quoted, speculate upon the national importance of the manufactures dependent upon our Mines of Coal. These now offer themselves to our consideration; and when we state that three-fourths of the Copper, four-fifths of the Tin Plates, and nearly one-third of the Iron consumed in the known world, are produced, or prepared for use, within the Mineral Basin of Glamorgan and the adjoining district, our attention will naturally be awakened to the vast importance of this part of our subject.

The manufactures of Great Britain heretofore dependent upon the woods and forests for their fuel, had assumed a great degree of comparative importance in the reign of Henry II. Henry of Huntingdon, who wrote in the early part of it, begins his history with a florid description of Britain, wherein he says, that Mines of Copper, Tin and Lead are abundant, and that there are some, tho' but few, Mines of Silver. At this time, or perhaps in the year 1189, it is certain that there was a rich Silver Mine within the confines of this very Basin, viz. between Llanelly and Basingwick.* Silver and Lead however have long since ceased to be wrought here: we will therefore direct our attention to the manufactures of Copper, Tin, and Iron, which are carried on to so enormous an extent.

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* Fanjas St. Fond's Travels in England and Scotland.

The Copper Works of the district are seated in the neighbourhood of Neath, Swansea, and Llanelly. They furnish direct and immediate employment to a population of not less than 3,000 persons, (exclusive of those employed in the mines which supply them with ore and fuel,) and the quantity of Copper annually produced amounts to about 14,000 tons. In the production of this about 200,000 Tons of Coal are annually consumed: this Coal is wrought from the Mineral Basin of which we are treating; but the Ore from which the Copper is extracted is the produce of distant mines, the principal part being obtained from the vast Copper Mines of Cornwall and Devon, and the Isle of Anglesea.

In the year 1690, Mines of Copper and Lead were found in the lands of Sir Carbery Price, in Cardiganshire, which, requiring great expense to work, were divided into 24 shares; and this was the origin of the Mine-adventurers' Company, the failure of which produced a wide extent of poverty and misery. In the year 1693, these 24 shares were divided in 4,000 shares: in 1698, the Duke of Leeds was established Governor of this Company, and Sir Humphrey Mackworth, Deputy Governor for life. Sir Humphrey Mackworth brought into this Company his own Lands, Coal Pits, and Mines near Neath, where Wharfs and Warehouses, Refining Houses and Mills, were erected, and much Lead ore was raised, from whence quantities of Silver were extracted. In 1704 Queen Anne granted a Charter of Incorporation to Thomas Duke of Leeds, Sir Humphrey Mackworth and others, "for working and managing Mines and Minerals, and for smelting and refining and manufacturing the same," &c. A few years afterwards this bubble, not very creditable to Sir Humphrey and the Duke, burst, and a vast extent of misery was occasioned thereby.

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* Giraldus Cambr. Itui. Cambr. L. ii. c. 10.

The individuals now principally concerned in carrying on the Copper Trade are, J. H. Vivian, Esq. the highly respected representative for the borough of Swansea, Messrs. Fox, Williams, Foster & Co. Pascoe, Grenfell & Sons, Daniell, Neville & Co. Benson, Logan & Co. Freeman & Co. and the English, Rose, Crown, Birmingham, and Forest Copper Companies, &c. &c.

The Tin Works of the District are seated on the rivers Avon-Llwydd, Ebbw, Taff and Avon, and also in the neighbourhood of Swansea and Llanelly. They afford direct employment to a population of not less than 4,000 persons, and the quantity of Tin Plates annually produced is about 180,000 boxes. The Iron and Coal, from and by means of which these Tin Plates are manufactured, are the produce of this Basin, but the Tin with which the Iron Plates are covered or coated, is obtained from the mines of Cornwall, from whence it is brought over in what are termed "Blocks." The principal Tin Plate Works are, Pontypool, carried on by Capel Hanbury Leigh, Esq.; Carleon, by John Jenkins, Esq. & Co. and R. & T. Fothergill, Esqrs.; Pontydyrau, by Messrs. Conway, Brothers; Pontnewydd, by Messrs. E. Jenkins & Co.; Melin Griffith, by Richard Blakemore, Esq. and his Nephew, (the author of this Treatise); Margam, by Robert Smith, Esq. & Co.; Cwm Avon, by John Vigurs, Esq.; Tydy, by Messrs. Daniell & Lewis; Ynyspenllwch, by J. Llewelin, Esq.; and Kidwelly, by Messrs. Vaughan.

The discovery of the British Mines of Tin, and of the art of extracting the metal from the ore, is beyond question of very remote antiquity indeed. That Tin was an article of commerce transported by the Carthaginians to Tyre near 600 years before the Christian Æra there is no doubt; that the Carthaginians at that time were the "universal merchants of the western world," and that through their instrumentality as "agents and carriers, the Indian, the Ethiopian, the Negro, the Briton, and the Scythian, living in the extremities of the world, and ignorant of each other's existence, contributed to each other's felicity by increasing their own," there can be as little question, and that the Tin transported by them was the produce of British mines is highly probable, indeed almost certain. Cæsar tells us that Tin was the great staple of Britain half a century before the Christian Æra (Bel. Gal.) That the merchants of Egypt in and about the seventy-third year of the Christian Æra carried into Persia and the contiguous country British Tin, is authentically handed down to us. During the lapse of the succeeding thousand years the exportation of Tin was very considerable;—for many ages during this time the mines of Cornwall and Devon supplied all Europe with it, and in the 12th century the profits of this exportation supplied a large portion of the Royal Revenue.* In the year 1338 all the Tin in England was seized by the King, and in 1347 a complaint was made to Parliament, "that all the Tin in Cornwall was bought and carried out of the country by a foreigner of the name of Tidman, of Limburgh, and that no Englishman could get any of it." The answer returned by Parliament was, that "the Tin belonged to the Prince, and every Lord might make his profit of his own."

However extraordinary it may appear that notwithstanding the very great probability that exists that the value of the produce of our mines of Tin was well known to the inhabitants of distant countries 2500 years ago, and that from and ever since that very remote period, the exportation from our island of this its native metal has been carried on and continued to a very great annual extent, yet the application of this metal by the natives of our own island to a purpose now became of immense national and domestic importance to our country, viz. the manufacture of Tin Plates did nof take place in Great Britain till the year 1681, when Andrew Yarrington, in a work entitled "England's Improvement by Sea and Land," asserts that Tin Plates (i. e. Iron Plates tinned over) were now made in England through his means, he having been employed by some gentlemen to go to Bohemia, where he learnt the art of making them. Yarrington was cheated out his discovery, and his employers discontinued their manufactory, and this manufacture remained for many years dormant and unpractised in Great Britain, till in the celebrated Bubble Year of 1720, it was one of the many projects set afloat, and in 1740 it was brought to a good deal of perfection; and the money which had been paid for this commodity, at that time had from Hamburg, was kept at home.

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* M. Paris, p. 570, Fœdera, Tom. I., Conventiones Litera et Acta publica, p. 243.

Although among the manufactures dependent upon our immense Coal field for their existence, we have placed that of Iron last in order for our consideration, yet it is not that we under-rate its importance, but on the contrary, considering its gigantic influence on the destinies, not only of our own country, but on those also of the whole habitable globe, we have reserved this branch of our national commercial industry for final consideration, as being incomparably more important than any that have preceded it, and therefore as being more fitted for winding up and closing this division of our subject.

Within the limits of a Treatise our bounds for historic research are much circumscribed; nevertheless in order to give some idea of the gradual and growing importance of this branch of our national commerce, we will endeavour to take a rapid survey of its progressive commencement, its early increase, and its present state among us. We cannot here attempt or pretend to enter into a history of this invaluable metal, of its original discovery, by whom, and to what purpose it was applied in the very earliest age of the world. Certain it is that in the ages preceding the Flood, the use of this and of other metals was known, as is testified by the brief history we posses of those ages, and in which mention is made of musical instruments then in use, as "Harps and Organs," and also of "works in brass and iron," the building of cities and villages, the construction of that enormous vessel the Ark, "an effort," says an intelligent writer, "of naval architecture vastly exceeding any modern one," the construction of that unweildy pile, the Tower of Babel, the works in various kinds of metals, iron included, mentioned in the history written by Moses, all tend to prove to demonstration, the extreme antiquity not only of the produce, but even of the manufacture and conversion and application of Iron to ordinary seus and purposes. However inviting though the subject be, on this our limits prevent our dwelling, and we must pass on to the first notices of the production of Iron in our own island.

Cæsar tells us (Bel. Gal. l. 3, c. 8, 9, lib. 4, c. 28, &c.) that on his arrival in Britain, fifty four years before the Christian Æra, our money was paid by weight and consisted of brass and iron, the former of which was imported, the latter found in our own mines. That the Iron Mines of our island were wrought by its natives long before the arrival of Cæsar there is no question, and that they were wrought afterwards by the Romans we have indubitable proof. During this period the seat of the Iron works was in Gloucestershire, where ore of the description termed Hœmatite abounds, thrown into the limestone, shewing itself on and near to the surface of the earth, and capable of being wrought without the aid of gunpowder. The excavations in which in and in the neighbourhood of the Forest of Dean, near Coleford, Monmouth, &c. and the quantities of Scoria, or which is termed Roman Cinder still found there, sufficiently indicate the vast extent to which these Iron Mines were explored. From Domesday Book we know that in the reign of Edward the Confessor there were iron works in the neighbourhood of Gloucester, and it is more than probable that these had been kept up since the period anterior to the invasion of the Romans. On the accession of William the Conqueror, or in 1066, Domesday Book also informs us that the City of Gloucester paid to the King among other things "thirty-six dicres of iron, and one hundred iron rods for nails or bolts to the King's ships," &c. In 1354, the Parliament enacted (by Stat. 28, Edward III, c. 5,) that no Iron should be carried out of the country, and in the year 1581, the works had so much increased that (by 23 Eliz. c. 5,) it was enacted, that "as Iron works or mills were great destroyers of timber and woods," their erection, except within certain limits, should be prohibited; and by enactment four years afterwards, it was ordered that "no timber of one foot square from the stub should be used as fuel for any Iron work." In 1627 a patent was granted by the King to Sir George Horsey, Knight, David Ramsey, Roger Folke, and Dud Dudley, Esquires, "for the sole practice of their invention for melting iron ore and making the same into cast works and bars with sea coal and pit coal only." In the narrative of his invention, his perseverance, his wrongs and misfortunes, one of these patentees (Dud Dudley) gives the following account of the state of the manufacture of Iron about this period. "In the interim of my proceedings," says he, in his Metallum Martis, "Cromwell and the then Parliament granted a patent and an Act of Parliament unto Captain Buck, for the making of Iron with pit coal and sea coal. Cromwell and many of his officers were partners, who set up divers and sundry works and furnaces at a vast charge in the Forest of Dean, and after they had spent much in their inventions and experiments, which were done in spacious wind furnaces, and also in pots of glass house clay, they failed, and in 1655, wearied of their invention, they desisted. Anno 1656, Captain John Copley, from Cornwall, obtained another patent for the making of Iron with pit coal and sea coal, and he set up works near Bristow (Bristol,) and endeavoured by engineers' assistance to get their bellows to be blown, which after great difficulty was accomplished; but in 1657, Copley becoming wearied and disheartened went to Ireland, and desisted from his inventions of making Iron with sea coal and pit coal." In 1660, Dud Dudley recommenced his operations, and he writes that he had not then "fully perfected or raised his invention to the *quantity* of charcoal iron furnaces" (which he states made "on an average *fifteen* tons of Pig Iron a week, and usually worked forty weeks in the year,) yet his quantity with sea and pit coal amounted to *seven* tons a week made at each of his furnaces." Dilating upon the great degree of perfection to which the manufacture of Iron had obtained in his time, (A. D. 1665,) Dud Dudley says, "let us look back into the making of Iron by our ancestors in foot blasts or bloomeries; that was, by men treading of the bellows, by which way they could make but one little lump or bloom of iron in a day, not one hundred weight, and that not fusible nor fined nor malleable until it was long burned and wrought under hammers, and whose first slag, sinder, or scorias doth contain in it as much or more Iron than in that day the workman or bloomer got out, which slag, sinder, or scorias is by our founders at furnaces wrought again and found to contain much Iron, and easier of fusion than any Ironstone or mine of Iron whatever; of which slag and sinders there is in many counties millions of tons, and oaks growing upon them very old and rotten."

"The next invention was to set up the bloomeries that went by water, which made more Iron and extracted more out of the slag or sinder, yet these bloomeries by water do make but two hundred pound weight of Iron, but some of the now going furnaces with charcoal do make two or three tons of pig or cast Iron in twenty-four hours."

Thus wrote Dud Dudley: and the substance of what he writes is, that with his invention he could make seven tons of Iron in a week with pit coal at each of his furnaces; that the charcoal furnaces, as then worked, produced from fifteen to twenty-one tons in a week.

This was the state of things in 1665: at the present time there are blast furnaces seated within the Mineral Basin of Glamorgan working with cokes produced from pit coal, one of which, at Plymouth Works, the property of Messrs. R. & A. Hill, has produced the astonishing quantity of 140 tons of Pig Iron in one week, and the average weekly produce of these furnaces exceeds 120 tons. But we must cease this digression, into which old Dud Dudley has led us, and retrace our chronological narrative of the progress of the manufacture of Iron.

In the year 1637 the King issued a proclamation, restricting the exportation of Iron, and preventing the sale of bad Iron, which the application of pit coal instead of charcoal for smelting and manufacturing purposes appears to have rendered necessary: strict regulations were also enforced for the cutting, cording, and converting of wood for making Iron. In the year 1719, it was stated, "that the waste and destruction of the woods in the counties of Warwick, Stafford, Worcester, Hereford, Monmouth, Gloucester and Salop, by the Iron works was not to be imagined; and that if some care were not taken to preserve our timber from these consuming furnaces, there would not be oak enough left to supply the Royal Navy and our mercantile shipping: that within these sixty years preceding, Ireland was better stocked with oak timber than England was then; but the Iron works since set up there had in a few years swept away the wood to that degree, that they had not small stuff enough left in Ireland to produce bark for their tanning, nor timber for common uses."*

In the year following Mr. William Wood, at that time a leading Iron Master, gave this account of the state of the Iron trade—"The Iron manufacture," he says, "is next to the woollen manufacture, the most considerable of all others of this nation. We now use about 30,000 tons of

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* Boyer's Political State of Great Britain from 1710 to 1740.

Iron a year, of which (for want of a sufficient supply of cordwood) we are forced to buy of our neighbours about 20,000 tons. We have Iron Stone enough, and may be able to supply ourselves with cordwood to make the greatest part, if not all, the iron we want, by planting," &c. Such is the account given of the Iron Trade by one of the principal members of it in 1720. In 1806, when the Government of the country proposed levying a tax on pig iron, (the danger and impolicy of which being made apparent, it was abandoned,) "An Iron Master"* published some most able observations on the threatened impost, in which he gives following description of the Iron Trade at that time:—

"It is," says he, "but little more than thirty years ago, when the only method known or practised in this country, or in any part of Europe, for the manufacture of Bar Iron, was with charcoal fire; the application of mineral fuel or coal to that purpose was deemed impracticable. At that time the greatest quantity of Bar Iron ever made in this country within the year was 20,000 tons, and our annual importation of foreign Iron from Russia and Sweden was from 50 to 70,000 tons, when it is considered that an Iron work in this country, to produce 1,000 tons of Bar Iron annually from the ore, requires 16,000 acres of wood land to support it, until the succession of woods in their regular course of cutting at sixteen years' growth comes round, it must appear that the utmost spirit and exertion of the British Iron Master could never extend the native produce of the country beyond a certain point which it had arrived at; but from the insufficiency of fuel to manufacture even that quantity, and from the interference of foreign Iron in the British market, our native produce was latterly reduced to less than 14,000 tons, a quantity not sufficient for the internal agricultural consumption of the country alone. The Iron works of this country, from the difficulty of collecting fuel, and the wide extended range of country necessary for that purpose, were necessarily of small extent, and established at considerable distances from each other; and there appears but little doubt, that had not some other means of making Iron been discovered, it would now be double or three times as dear as it is, and that we should have remained stationary in respect to improvements in the Arts and to the immense improvements of our machinery." This able writer continues, "When the British Iron Master first introduced the process of manufacturing Bar Iron with pit coal, a process scarcely known even now in any other country in Europe, he had difficulties almost insurmountable to contend with: the immense capital necessary to adventure in the first instance—the great hazard of success from the uncertain proof of the minerals—the inferior quality of coke iron at that time compared with charcoal—the prejudice of the consumer in favour of charcoal iron—the low price at which it was necessary to sell coke iron to give it even a chance of an introduction into consumption; all these circumstances, with many others, kept the works for many years in a state of great depression." From returns that the writer states had then been recently collected, "it appears," he says, "that there are in Great Britain 220 blast furnaces, of which 169 were at work last year, and made 249,500 tons of Pig Iron, (twelve years ago the quantity of Pig Iron made scarcely exceeded 100,000 tons annually)—that about 95,000 tons of Bar Iron are annually manufactured, the average price of which at the works was £17 per ton."

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* Richard Blakemore, Esq.

Having given this rapid sketch of the early history of the Iron Trade, and of the state to which it had attained in the early part and at the close of the last century, and also at the commencement of the present one, we will now trace its progress to the present time, influenced as that progress has been in so important a degree by the developement and application of the gigantic resources of the Mineral Basin of Glamorgan and the adjoining district.

By the activity and exertion of a spirited and intelligent Staffordshire Iron Master,* returns were collected in the year 1832 of the number of Blast Furnaces in Shropshire, Staffordshire and South Wales, and their produce and make of Pig Iron in the years 1823 and 1830. The following are the results:—

| | 1823 | | AND 1830. | |
|---|---|---|---|---|
| | *No. of Furnaces.* | *Make of Pig Iron.* | *No. of Furnaces.* | *Make of Pig Iron.* |
| Shropshire | 38 | 57,923 Tons | 48 | 73,418 Tons. |
| Staffordshire | 84 | 133,580 | 123 | 212,604 |
| South Wales | 72 | 180,827 | 110 | 270,407 |

*No returns were procured from the other Iron districts in 1832, but in 1827, there were in*

| | | |
|---|---|---|
| Yorkshire | 24 Furnaces, producing | 43,206 Tons. |
| Scotland | 18 Ditto | 36,490 |
| North Wales | 12 Ditto | 24,300 |
| Derbyshire | 14 Ditto | 20,570 |
| | | 680,995 Tons. |

Thus, therefore, stands the progress of the Iron manufacture of this kingdom in the years

| | 1720. | 1794. | 1805. | 1830. |
|---|---|---|---|---|
| The quantities produced.— | 10,000 | 100,000 | 249,500 | 680,995 Tons. |

of which the Iron Works seated in the Mineral Basin of Glamorgan and the adjoining district produced in the year 1830, 270,407 tons, or upwards of 20,000 tons more than in the year 1805 all the Iron Works in Great Britain produced together.

* F. Finch, Esq.

The great establishments of the district at which the above astonishing quantities of Iron are annually made are,

| | *Proprietors.* | *No. of Furnaces* |
|---|---|---|
| Cyfarthfa 9 and Hirwain 4 | William Crawshay, Esq. | 13 |
| Dowlais | Guest, Lewis & Co. | 12 |
| Plymouth | R. & A. Hill | 7 |
| Penydarran | Thompson & Forman | 5 |
| Rumney & Bute | Ditto | 4 |
| Tredegar | Samuel & W. Homfray & Co. | 5 |
| Aberdare | Thompson & Forman | 6 |
| Sirhowy & Ebbw Vale | Harfords, Davies & Co. | 7 |
| Nantyglo | Joseph & C. Bailey | 7 |
| Beaufort | Ditto | 4 |
| Abersychan | British Iron Company | 5 |
| Varteg | Kenricks & Co. | 5 |
| Blaenavon | Hills & Wheeley | 4 |
| Clydach | Frere & Co. | 3 |
| Pontypool | C. H. Leigh | 3 |
| Peatwyn | Hurst, Brothers & Co. | 2 |
| Coalbrook Vale | Brewer and Perkins | 2 |
| Blaena | Brown & Co. | 2 |
| Yniscedwin | Crane & Co. | 2 |
| Maesteg | Buckland, Jones & Co. | 2 |
| Pontrhydyven | Reynolds & Co. | 2 |
| Cwmbychan | J. Vigurs & Co. | 2 |
| Pentyrch | R. Blakemore & Co. | 1 |
| Gadlys | Williams & Co. | 1 |
| Rudry | Pope & Co. | 1 |
| Cefn Cribbwr | Bryant & Co. | 1 |

The quantity of Coal consumed by these works is not less than 1,000,000 tons a year; the number of persons actually employed at them is about 25,000, who with their families, are dependant upon them: it may therefore be stated that not fewer than 120,000 persons derive their support from the iron works established in the Mineral Basin of Glamorgan and the adjoining district.

The immense excavations in the Hœmatite iron ore on the southern edge of the Basin very much resembles the antient workings in the same ore in the Forest of Dean, and all trace either by history or tradition having been lost as to the period when these excavations were made (although from their nature it is evident they were effected without the aid of gunpowder, and consequently at a time prior to that invention,) the inference appears but reasonable that iron was extracted from the ore in Wales (in Glamorganshire*) at as early a period as in England (in Gloucestershire.) There is a spot on the banks of the river Taff about six miles from Cardiff, for many generations called "*Old Furnace,*" whereon it is supposed the oldest furnace in the district formerly stood. The earliest Iron works in the district, of the erection of which we have authentic record, are those at Pontypool, which were established in the year 1565, by John Hanbury, Esq. an ancestor of the present estimable proprietor, Capel Hanbury Leigh, &c. The great works of Merthyr Tydvil, Nantyglo, Sirhowy, &c. are of far more recent date.†

In the production of these staple articles of manufacture of which we have treated, and in shipments made from the maritime ports herein before enumerated, the following is about the aunual consumption of Coal:—

| | |
|---|---|
| The Copper Works consume annually about ........ | 150,000 Tons. |
| Tin Works ............................. | 100,000 |
| Iron Works ............................. | 1,000,000 |
| Shipments from the several Ports .............. | 1,100,000 |
| Agricultural and domestic uses................ | 650,000 |
| Total quantity of Coal wrought from this Mineral Basin | 3,000,000 tons annually. |

These are quantities well calculated to startle us, and to cause the enquiry, How long are the means and sources of supply likely to meet so enormous an annual demand? In the solution of this question, Mr. Martin has made an ingenious calculation of the extent of the Mineral Contents of this Basin, and taking the average length and breadth thereof, he states it to contain 100 square miles, and then taking the cubic contents of the Coal, he states it to contain 64,000,000 tons per square mile, (Geology of England and Wales, p. 426—7.) According to this calculation, therefore, this Basin contains 6,400,000,000 tons of Coal. The consumption as above stated is 3,000,000 tons per year; the supply therefore will meet the present demand, enormous as it is, for 2,133 years.

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* See Appendix No. 3.

† See Appendix No. 4.

" The manufacturing industry of the island," say the enlightened Geologists* of England and Wales, " colossal as is the fabric which it has raised, rests on no other base than our fortunate position with regard to the rocks of our Coal formations. Should our Coal mines ever be exhausted, it would melt away at once, and it need not be said that the effect produced on private and domestic comfort be equally felt with the diminution of public wealth, we should lose many of the advantages of our high cultivation, and much of our cultivated grounds must be again shaded with forests to afford fuel to a remnant of our present population. That there is a progressive tendency to approach this limit is certain; but ages may yet pass before it is felt very sensibly; and when it does approach, the increasing difficulty and expense of working the mines of Coal will operate by successive and gradual checks against its consumption through a long period, so that the transition may not be very violent: our manufactures would first feel the shock; the excess of population supported by them would cease to be called into existence, as the demand for their labour ceased; and the cultivation of poor lands would become less profitable, and their conversion into forests more so."

* Conybeare and Phillips.

Regarding the minerals of our district in a national point of view, let us contemplate them as thus beautifully described, and as forming the basis of our manufacturing industry, and therefore as the foundation upon which reposes the "colossal fabric" which that industry has reared. They lie in the bowels of the earth in a state totally inactive and unproductive, and of no intrinsic value, until wrought and brought forth by the labour of our native population employed upon them: their ultimate value is no other than the representative of so much labour as has been bestowed upon them. Every ton we export to foreign countries and require money for in return, introduces into this country so much addition to the public stock that has cost us nothing. The aggregate value of the Copper, Tin, and Iron annually manufactured within this Basin, and of the Coal exported therefrom, even at the present low prices of each article, may be stated at £3,600,000, which amount is annually added to our national fund by the labour of our population alone. Supposing our nation for its own domestic purposes were compelled to purchase equal quantities of these several articles, we should diminish our national fund by as much as we paid out of it to make these purchases; and certain it is that no country in the world could supply them to us, at any thing like the cost at which we ourselves produce them. Taking them, however, at our own cost price, the difference would be upwards of seven millions sterling between being ourselves makers of our own Copper, Tin and Iron, and miners of our own Coal within the Mineral Basin, and being dependent upon other nations for our supply. But if to this we add the actual value to which our Copper, Tin, and Iron are wrought in their progress through the hands of our native artisans; instead of their value being three millions and a half, they must be put down at the very least at treble this amount: and then taking also into our view the immense proportion of our commercial marine to which employment is afforded by those branches of our national commerce, our considerations of their national importance will be greatly enhanced indeed.

At this epoch of time it can scarcely be necessary to argue the question whether the commerce and manufactures of a country are sources of national benefit and advantage. No less incontrovertibly true than strikingly beautiful, was the illustration of the late Lord Erskine, when he said—"You might as well hope to see a tree flourishing after its roots are decayed, or the human body in active motion when palsy has reached the heart, as expect to see manufactures or arts or industry of any kind or description progressive, when agriculture has declined." And equally true and striking and incontrovertible is the observation of a most able writer,* that "as agriculture is the foundation, so are manufactures and fisheries the pillars, and navigation the wings of commerce; and commerce is universally known to be the chief source of the prosperity and also of the power of the British Empire. Nations merely agricultural, or agricultural and pastoral, may indeed posses a sufficiency of food, and some rude kind of clothing; but they must be indebted to their more industrious neighbours for manufacturing, and also bringing to them every article of comfort and enjoyment, the purchase of which by bartering their corn and cattle for them, necessarily produces the first rudiments of a passive trade. In a country destitute of commerce, superior talents are of little value, and industry would toil in vain: a redundance of produce is useless, a deficiency is death."

If these things are so, if agriculture be the foundation of our commercial wealth, and commerce be the source of our national power and prosperity, it must of necessity follow, that the interests and well-being of the one are not only compatible with, but inseparable from those of the other. It is an evil, and a most dangerous and fatal one of the present day, that these two great arms of our national strength are placed in conflict, and brought into ruinous collision against each other. The agriculturist is led to believe that commerce and manufactures, so far from benefiting him, are the fruitful means of increasing local taxation, and of creating parochial burthens, the liquidation of which is unduly and oppressively thrown upon the industrious cultivators of the soil;—and the operative and mechanic are deluded with the dangerous doctrine, that the protection granted by the legislature to the agriculturist, operates as a prevention to the cheap enjoyment of that article of primary, nay, of indispensable necessity, ***Bread.*** The agriculturist says, " Tax the manufacturer, and make him bear local and parochial burthens equally with me." The mechanic, the artisan, or the operative says, " Let me buy my corn and bread wherever I can get them cheapest,—all the nations of the earth are but members of the whole human family—what are the agriculturists of this island to me more than those of any other,—give me *the greatest happiness to the greatest number,*—and this can never be attained while the agricultural produce of the British farmer is in any degree sheltered or protected from full, free, open, and unreserved competition;—away then, and down with all monopolies, restrictions and prohibitions!" *Dangerous, mad, and infatuated doctrines!* the promulgation of which places in deadly and fatal array against each other, the two arms of our national strength, whose united energies, if otherwise engaged and encouraged in mutually and reciprocally assisting each other, and to use a homely phrase, in pulling together, would infalibly protect their common country from danger and derangement either by assaults from within, or aggression from without. Let the agriculturist for a moment contemplate, as well the market for his produce which the manufacturing and trading and commercial population afford him, as the gigantic contributions which the manufacturer, the merchant and the trader make to the national burthens.

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* David Mac Pherson.

| | |
|---|---|
| The Revenue of Great Britain for the last year was | £47,123,298 |
| Of which Sum, in Customs alone, was levied | 16,516,271 |
| Excise (two-thirds of which at least fell on the commercial and manufacturing population) | 16,303,025 |
| Stamps (nine-tenths of which fell on ditto) | 6,947,829 |
| During the same year the amount collected in England and Wales, and expended in the Relief of the Poor, was | 6.798,888 |

About two-thirds of which probably fell on the agriculturalists, and although this pressure, added to that arising from the impost of County Rates, is undoubtedly very great, yet it was not so great even as the amount levied on the distribution of Stamps; the use of which in all mercantile transactions is too well known to need explanation. Again, let the agriculturist reflect, that to such a height has the manufacturing industry of this country attained, that the families employed in trading and manufacturing pursuits, according to the Census taken in 1831,
Amounted to .............................. 1,182,913
While those employed in agriculture amounted to 761,348
These facts and figures will convince the agriculturist that the commerce and manufactures of the country, exposed as they are to competition and rivalry with every nation of the world, bear their full share of the national burthens, and employ their full proportion of our native population; which, but for them, would either be redundant or unemployed, or else not called into existence; if the former,

the land would inevitably have to maintain them,—if the latter, and our country were only half, or less than half as densely peopled as it is, how should we stand in the scale of nations, and where could our sinews be to protect us in case of foreign aggression.

While these considerations press on the agriculturist, let the manufacturer, the merchant, the artisan, the operative, and the mechanic contemplate but for a moment that 38,500,000 acres of the surface of our island are subject to the tillage of their agricultural countrymen:

| | |
|---|---|
| That the annual value of agricultural productions amounts to .... | £246,500,000 |
| That the value of agricultural machinery, cattle, horses, &c. &c. amounts to .... | 301,900,000 |
| That the amount of capital invested in land for the purpose of cultivation is .... | 1,600,000,000 |
| That the probable value of wastes capable of improvement is...... | 176,000,000 |
| These together forming a grand total* of agricultural produce and property of .... | £2,324,500,000 |
| That the annual value of manufacturing, mineral and commercial productions is.... | £233,825,000 |
| And the total capital represented by the productive property of Great Britain is .... | 3,679,500,000 |

In reflecting on these international resources, let *all*, whether dependent upon agriculture, manufactures or commerce, instead of too anxiously directing their views and anxieties to distant countries, contemplate of how immeasurably greater importance is the demand for the productions of their native industry at home. This must be apparent from the following facts:—

| | |
|---|---|
| The annual value of our agricultural productions, as already stated, is.... | £246,500,000 |
| Ditto of manufacturing, mineral and commercial productions, as already stated, is .... | 233,825,000 |
| Making a total of the annual value of our National Resources .... | £480,425,000 |

* Resources of Great Britain.

| | |
|---|---|
| The value of British and Irish produce and manufactures exported in the year 1831, was by a Parliamentary Document, No 367.. | £37,161,372 |
| The excess of value of our home consumption or international trade over that of our foreign, therefore is........................ | £443,260,628 |

*And their relative magnitude and importance are as about* 1 *to* 12.

It is not our business nor our intention to indulge in the speculative theories of what is termed the science of political economy: our object has rather been to develope facts upon which others, as well as ourselves, may exercise their reason, and from which accurate conclusions may be formed. With these facts before us however, affording as they do proofs of what national resources we possess, and with the bitter experience we have tasted of the internal difficulties, to which our nation has been exposed, of the languid depression both of her agriculture and commerce, it is difficult to check the enquiry into the causes of our national difficulties. Upon this however we cannot enter here. That our difficulties are but temporary and transient, that the body politic, diseased as it unquestionably is, alternately labouring under irritable excitement, which is again succeeded by morbid languor, has strengh and stamina abundantly sufficient to warrant a confidence in its healthy and vigorous restoration, we may we hope reasonably and certainly persuade ourselves. It has been well said, that "in the political body, the natural efforts which every man is continually making to better his own condition, is a principle of preservation capable of preventing and correcting in many respects the bad effects of a political economy in some degree perhaps partial and oppressive. Such a political economy, though it no doubt retards more or less, is not always capable of stopping altogether the natural progress of a nation to wealth and prosperity, still less to make it go backwards. In the political body the wisdom of nature has fortunately made ample provision for remedying many of the bad effects of the folly and injustice of man, in the same manner as it has done in the natural body, for remedying those of his sloth and intemperance."*

To ensure, however, as far as human means can ensure, prosperity to a nation circumstanced as ours is, with an immense population dependent alike upon agriculture and commerce, it is indispensible that PROPERTY should possess its legitimate influence, that CAPITAL should find security and encouragement, and that LABOUR should meet with a ready demand and a certainty of adequate remuneration. If *Property* be shorn of its proper influence, those who own it will derive little satisfaction from the possession of it, and little pains will be taken in strengthening local interests, and social ties and attachments: if *Capital* be insecure, there is every reason to apprehend either its sudden or gradual withdrawal, and very little chance of its being permanently invested: and then *Labour* will in vain seek for demand, for employment, or remuneration. These are truths and considerations worthy the serious attention as well of those who rule as of those who obey. The happiness of our common country is, under the blessing of Divine Providence, in our own keeping; may we so use and improve the means of happiness placed at our disposal, as that there be no national "Decay, no leading into captivity, and no complaining in our streets."

That while Thrones have tottered and fallen to the earth, while Empires have been shaken, and Principalities and Powers have been convulsed to their very centres, our own country has, under every variety of regimen to which she has been subjected, attained a height of unexampled wealth and power and prosperity, there can be no question: that she possesses within herself resources of gigantic magnitude there can be as little doubt, and that among those resources, *the Mineral Basin of Glamorgan and the adjoining district* is one of the very chiefest, and that *national benefits* of the most transcendent kind *arise therefrom,* it has been the Author's humble, and, he trusts, not unsuccessful endeavour to prove.

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* Adam Smith's Wealth of Nations.

CARREG.

# APPENDIX.

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## No. I.

It is a highly interesting fact, and one bearing directly upon the geological division of our subject, that the Mineral Basin of Glamorgan and the adjoining district elicited the earliest observations of which we have any record, either in our own, or in any other language or country, which tended to establish the fundamental principle on which the science of geology is founded, viz. "that the same series of rocks succeed each other, in a regular order, throughout extensive districts; and to elucidate the geological structure thus indicated."

In the year 1595, a Welshman, George Owen Esq. of Hènllys, Lord of Cemaes, compiled a History of his native county, Pembrokshire. This history remained in MS. and unpublished two entire centuries: in the year 1796, the great Grandson of its Author, Richard Fenton Esq. communicated it to the "Cambrian Register." and, subsequently, in the year 1810, in an Appendix to his highly interesting "*Tour through Pembrokshire,*" the same Mr. Fenton quoted largely from this MS. of his observing, and learned, and antiquarian ancestor. From this MS. the following strikingly original description of this Mineral Basin, and of its connection with similar districts, in Gloucestershire and Somerset, is extracted:—

"Now that I have briefly over-run the tilling of the lande, I will speake somewhat of the natural helpes, which is in the country, to better the lande, and to make it more fruitful, and apt to bear corn and grasse. The chiefest therefore I reckon the lyme, for that it is most commonlie used, and found to be lesse charge then the marle, which I take to be the best kindes of these naturall helpes, yielded by the soile itself. And first you shall understand, that the lymestone is a veyne of stones running his course for the most parte right east and west, although sometymes the same is found to approach to the north and south ; yet is the mayne course thereof, as I take it all other vaynes of this realme are, alsoe found from east to west. Of this lymestone there is found of ancient, two veynes, the one small and of noe great amount, which is first seen in the Cliffes of Galtop, in the parish of Talbenny, and lying there very deep, is not dug till it com to Johnston Ground, which lyeth east of Gallop. At Johnston some is dug up, but it scarce requiteth the charge, and therefore there is little use made of it: from Johnston it runneth further eastward, and sheweth itself in the Cliffe of Haroston, somewhat south of the Old Church there ; and soe crosseth over there the first branch of Mylford to Boulston Ground, where it is found againe, and burned, and goeth on to Picton Land and Slebech, and thence crosseth the other branch of Mylford, and holding eastward, appeareth at Moncton by the wood, and soe eastward to Ludchurch, and thence to the sea, passing out of Penbrokshire. This vayne is not of bredth above a butt length, or stones cast, and therefore whosoever seeketh southward or northward over the bredth, misseth it ; but eastward and westward it is found to continue although not in every place, appearing by reason of his deepe lying in the ground in some places. And although it be somewhat from my purpose to treat of matters out of Penbrokshire, yet because I have sayed that this veyne of lymestone naturally taketh his course from west to east, I will follow on the course of this veyne soe farre as I have seen and learned the same. This veyne, continuing his course eastward, at Cromweare entereth into the sea, passing south of Ereweare, sheweth againe at Castell Hobly and Pendine, in Carmarthenshire ; and then passing under Laugharn Marsh appeareth againe at the wood in Laugharn, and holding still eastward, sheweth at Lanstephau ; from thence it entreth in between the two rivers of Gwendraeth in Carmarthenshire, and is found at the Glyn. Between the saide two rivers of Gwendraeth there ariseth a great hill, called Mynith Kyvor, which runneth eastward, and is all lymestone, which passeth on in the same course to Castell Kyrig Kynon, and all along the topp of the black mountains south of Capel Gwinsay by Blaen Cumgarw, between the rivers Clydach and Aman, and soe by Llwyn y Constable, and between the risings of the rivers Neath and Uske, to Blaen Cray, and to the great hill of Blaen Cwm Collwyn, and soe to Llanygrwyne, crossing the Uske to Tavarn y Maith Syr. Further than which I have not learned the course of the sayd veyne.

"The other veyne of lymestone, and chiefest of the two, begineth at the mouth of Mylford Haven, west of the Nangle Pile, when the one side of the Pile you shall perceive the lymestone, and the other a red stone, which for the most part accompanieth this veyne throweout, being in collour and substance like a stone burned with fire. This veyne of lymestone is very broad, for southward as it goeth, it reacheth to the sea, both in Penbrokshire, Glamorganshire, and Monmouthshire, and therefore will I follow the northern lymitt thereof, and soe follow on eastward, as his general course runneth. This veyne is about seven miles distant from the former, more southerly then it, and so or more they continue together as shall be declared. But now to my purpose: the northern lymitt of this veyne passeth as the former did, right eastward, and goeth to Peterchurch, and to Williamston by Carew, and soe eastward to St. Florens, and to the norther side of the town of Tenby, where, between it and the Windmills, it alsoe goeth to the sea; and still continuing an easterly course, there it taketh water, and passing under the sea there, as reason, and the course thereof leadeth us to think, sheweth itself right east of Tenby, in the Cliffes of Llandridion, in Gower, being as we may judge, about twenty miles from Tenby; all under the salt water from Llandridion, it passeth right east throw Gower, to the Mombles by Oystermouth, leving all the country between it and the sea, all of lymestone; but more northerly it is not to be found. At the Mombles the sea cometh more northerly than the veyne, therefore at the Mombles it goeth againe under the salt water, and continuing right east is found againe at the sea side at Kynfig Water, a little above Margam; and from thence passeth all the sweete and fruitful Vale of Glamorgan, all along under the mountaines to Keven Mably, where, passing over the river Rumney, it entereth Monmouthshire, and is found at or neare Tombarlon Hill, and from thence, with an eastward course, throw Monmouthshire directly towards Chepstow towne, there crosseth the river Wey, intruding itself into the Forest of Dean, to the Beacon above Wolcaston; from thence it passeth to Aust, and there crossing goeth towards Sedbury; but where the norther lansker there is to be found I know not as yet, but I find it Bristoward at Westburie, and so to Bristowe all the way; and from Bristowe eastward, till you come to the hill right over against Bath, where, as I take it, it turneth into a kinde of free-stone, which alsoe in that place is burned into lyme.

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"For the veyne of coakes which is found between those two vaynes of lymestone, as a benefit of nature, without the which the profitt of the lymestone were neare lost, though in some places they burne it with wood, I will defer to speake of till hereafter, where I meane of the severall sortes of fuell in Penbrokeshire, only this I think fit to say in this place, that betweene the sayde two veynes, from the beginning to the ending, there is a veyne (if not several veynes of coles) that followeth those of the lymestone, and serveth for a principal fuell in most countreys where it is found, and carried into foreign partes also, if the commodiousness of the sea do so permit. This veyne of cole in some parts joineth close to the first lymestone veyne, as in Penbrokeshire and Carmarthenshire; and in some partes it is found close by the other veyne of lymestone, as in Glamorgan, Monmouth and Somersetshires. Therefore whether I shall say there are two veynes of coles to be found betweene these two veynes of lymestone, or to imagine that the cole should wreathe or twine itself in some place to one, and in other places to the other, or to thinke that all the land betweene these two veynes should be stored with coles, I leave to the judgment of the skilfull miners, or those which with deep knowledge, have entered into these hidden secrettes.

"Woodes and forestes in tymes past, and now destroyed, were Llydiarth Foreste, Rywran, Moelgrove, Coedcadw &c. &c. With these woodes, and other of the meaner sorte, most of the Gentlemen of the sheere are well served with the wood for their fuell: but for the most parte, those that dwell neere the cole, or that may have it carried by water with ease, use most cole fires in their Kitchings, and some in their Halles, because it is a ready fiere, and very good and sweete to rost and boyle meate, and voyde of smoake, where yet Chymnies are, and doth not require a man's labour to cleve wood and feede the fiere continually. Next unto the wood, or rather to be preferred before it for fuell, is cole fiere, for the generalitie of it, as that which servith most people, and especially the cheese townes. This cole may be nomberid as one of the cheefe commodities of this country, and is so necessarie, as without it the country would be in great distress. It is called stone cole, for the hardness thereof, and is burned in chimnies and grates of iron; and being once kindled, giveth a greater heate than light, and delighteth to burn in darke places; it servith alsoe for smithes to worke with, though not soe well as the other kinde of cole, called the running cole, for that, when it first kindleth, it melteth and runneth as wax, and groweth into one clodd, whereas this stone cole burneth aparte, and never clyngeth together. This kinde of cole is not noysome for the smoake, nor nothinge soe lothsome for the smell, as the ring cole is, whose smoake annoyeth all things neare it, as fyne linen, men's handes that warm themselves by it; but this stone cole yieldeth in a manner noe smoake after it is kindled, and is soe pure, that fine camerick aud lawne is usually dried by it, without any stayne or blemish, and is a most proved good dryer of malt, therein passing wood, ferne, or strawe. This cole for the rare properties thereof was carried out of this countrey, to the citie of London, to the late Lord Treasurer, Burley, by a gentleman of experience, to shewe how farre the same excelled that of Newcastell, wherewith the citie of London is servid; and I think if the passage were not soe tedious, there would be greate use made of it.

"And now that I am come to entreate of this our countrey coles, I must remember my promise made before, when I spake of the veynes of lymestone, which I said was found to accompany the veynes of coles. And therefore I will, in as fewe wordes as I can, shewe you the naturall course of this cole, and how the same doeth accompanye the lymestone veyne, I said that I founed out two veynes of lymestones, to have their originall here in Penbrokeshire, and that their course holdeth eastward, as before I have declared at large. Between both which veynes of lymestone the cole is found to followe, though but not soe open as the lymestone, in every place with the lymestone; but in many places where the stone sheweth, the cole hideth himselfe; and where the cole is found, sometimes the lymestone lurketh under ground; but in many places they are found neere together. And first, our coles have been found near Talberye, and soe followeth on to Johnston, and there found; then at Trestrope greate store, and soe at Picton: it is alsoe founde by the souther veyne of lymestone at Jeffreston, and from thence to Begelly. This first veyne of cole followeth the first veyne of lymestone, keeping on the south side of it, to the water, and soe the mouth of Towye, over the barre of Carmarthen, where the very veyne of cole is found in the barre, by sounding, and soe throw all Carmarthenshire and Breknocksheere *(query, Glamorganshire,)* on to Monmouthsheere, as I have before declared the course of that lymestone veyne.

"The other veyne of cole which I spake of at Jeffreston, accompanyeth the second veyne of lymestone on the north side thereof, within half a mile of the lymestone, and passeth east at Sander Foote, and there with the lymestone into the sea; and sheweth againe neare Llanrydian and Lougher, as I sayed before and soe throw Gower, to the Mumbles, and under the sea over to Kynfig Water, and throw all Glamorgan and Monmouthsheers, over Aust, and to Bristow; the cole alwayes accompanying the lymestone a myle on the north of it, but in this course of both the veynes of lymestone and cole, one thing is to be noted, that the further east the veynes runne, the softer groweth both the cole and lymestone, and the eaiser to be digged.

"The digging of this cole is of ancient tymes used in Penbroksheere, but not in such extent and skilfull sorte as now it is, for in former tyme they used not engines for lifting up of the cole out of the pitt, but made their entrance slope, so as the people carried the coles uppon theire backs along stayers, which they called landwayes; whereas now they sinke their pitts downe-right foure square, and with a wyndles turned by foure men, they draw upp the coles a barrell full at once by a rope; this they call a down righte dore. The Lords of the land have eyther rent, or the third barrell, after all charges of the worke deducted.

"The cole is first founde by a small appearance thereof, which they call Edge, which being found, they search which waye the veyne leaneth, and on the contrary side they begin to sinke, for the cole is found to lye slope in the ground, and seldom down right; the cole being found the workmen follow the veyne every way, untill it end, or be letted by water or rocke; the veyne will not be for the most parte passing five or six foote deepe, soe that the cole is carried stooping, for they commonly leave a foote of cole in the bottom undigged, to serve for a strong foundation, except they finde the rocke under foote, which they call the Doon Stone; which if they finde, then they dig cleane throw all the cole, and further than that stone they looke for noe cole; and over head they are driven to timber their worke, to keepe the earth from falling, which is chargeable; but in some grounds they have a rocke above, and then they save much labour and cost in sparing of timber.

"In these workes the water springs are troblesome, which they avoid by sinking a great pitt right under the dore, to which all the water will run, and from thence draw it up with a wyndles, by barrells or els, by making a levell (as they call it,) which is by a waye digged under ground, somewhat lower then the worke, to bring a passage for the water; this is very chargeable, and may cost sometimes twenty poundes, and oftentimes more. They now most commonly sinke down right twelve sixteen, or twenty fathom, before they come to the cole, whereas in old tymes four fathom was counted a great labour. When they finde it, they worke sondrie holes, one for every digger, some two, some three or four, as the number of diggers are; eche man working by candle light, and sitting while he worketh; then have they bearers which are boyes that bear the coles in fitte basketts on theire backes, going always stooping, by reason of the lownes of the pitt; each bearer carrieth this baskett six fathom, when upon a benche of stone he layeth it: where meeteth him another boy with an empty basket which he giveth him, and taketh that which is full of coles, and carrieth it as farre, when another meeteth him, and soe till they come under the dore, where it is lifted up. In one pitt there will be sixteen persons, whereof there will be three pickaxes digging, seven bearers, one filler, four winders, and twoe ridlers, who ridle the coles when it is a lande, first to draw the small cole from the bigg, by one kinde of ridell, then the second ridling with a smaller ridell, with which they draw smaller coles for the smythes from the colme, which is indeede but very dust, which servith for lyme burning. These persons will lande about eighty or one hundred barrells of cole in a day. Theire tooles about this worke are pickaxes with a round pole, wedges and sledges to batter the rockes that crosse their worke.

"All tymes of the year is indifferent for working, but the hott weather worst, by reason of sodaine dampes that happen which oftentimes cause the workmen to swoond, and will not suffer the candells to burne, but the flame waxing blew of coller, will of themselves go out. They worke from six a clock to six a clock, and rest an hour at noone, and eate their allowance as they terme it, which is 6d. in bred to every man, and 4d. in drinke amonge a dozen: this is of custome on the charge of the pitt, altho they worke on theire owne charge. All theire worke is by candell-light throweout the yeare.

"The cole they finde is eyther an ore cole, a string, or a slatche, as I have learned theire termes. The ore is the best, and is a great veyne spreading every waye, and endureth longest; the string is a small narrow veyne, sometimes twoe, three, four foote in bignes, and runneth downe right, and is alwaies found betweene two rockes; a slatche they call a piece of cole by itselfe, found in the earth, and is quickly digged about, and no more to be formed of that piece. The first of those three sortes is the best, then the next, and the last countid worst of all.

"The dangers in digging these coles is the falling of the earth and quelling the poore people, or stopping of the waye forth, and soe dye by famine, or els the sodaine irruption of standing water, in old works. The workmen of this black labour observe all abolished holy dayes, and cannot be wayned from that follye.

"About three yeares past there was a generall and new imposition or custome raysed upon the coles, throwout the realme, which was that for every chauldron transported, her Majestye shall have a custome at the rate of 4d. for every barrell, whereas the pryce of the barrell is but 6d. soe that the custome is neare as much as the pryce of the cole; and the like custome was demanded for the culme, which was sold but for one penny the barrell; for which the Irishmen, who are servid from this country, and the seamen greatly complained, alledging theire trade impayred, and that it would turne to the decaye of shipping: but the countrey people well liked of it, as that which might be the means to stay the transporting, which hath greatly enhanced the pryce, and is feared that in tyme will wholly were out the cole, and soe leave the countrey destitute of fuell; but upon complaint of her Majestie's subjects in Ireland, this imposition is remitted for the Irishmen."

It would be difficult to give a more accurate description of the course and range of the measures, the position of the limestone and coal formations, the distinguishing characteristics of the veins of stone and bituminous coal, the practical operations of mining, the difficulties, hazard, and cost to be encounter'd, and the habits of the population employed in the works and mines, even at the present day, than is contained in the foregoing Extracts. The application of that mighty engine, Steam, and the discoveries and improvements in mechanical science, having been directed to draining the mines, and lifting and removing their produce from the utmost depths to which skill and enterprise can penetrate, have undoubtedly effected a great deal; but still a great deal remains, after a lapse of more than two hundred years, to prove that our ancestors possessed skill and enterprise as well as ourselves.

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## No. II.

In speaking of the Island of Barry, situate a little to the west of Penarth, Camden, quoting from Giraldus, says,

"In a maritime rock of this island, there is a narrow chink or chest, to which if you put your ear, you shall perceive such a noise as if smiths were at work there. For sometimes you hear the blowing of the bellows, at other times the strokes of the hammers, also the grinding of tools, the hissing noise of steel gads, of fire burning in furnaces, &c. These sounds I should suppose might be occasioned by the repercussion of the sea waters into these chinks; but they are continued at low ebb, when there's no water at all, as well as at full tide."

How singularly prophetic (we may term it) were these extraordinary and unaccounted-for sounds, of the busy noise, and din, and clangour, which, though then silent in our mountains, have since been awakened to the very life and likeness and similitude of this prophetic description!

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## No. III.

The Rev. William Harris, Prebendary of Llandaff, in a paper read before the Society of Antiquaries, observes:—

"Four miles north west of Bolston Gaer, a large Bed of Cinders has of late been smelted over again, as the heat of our modern furnaces is more intense, by the water motion of the bellows, than in the Roman times: and under this bed (which lies near Miskin, the seat of William Bassett, Esq.) a coin of Antoninus Pius was found last year (1762,) with a piece of fine earthenware, charged with greyhounds, hares, &c. which the workmen broke to pieces."—*Archæologia, Vol. II. p.* 1.

The coin and tile found under a heap of slag or cinders, afford conclusive evidence of the Roman workings; and their site is on the southern edge of the Mineral Basin, and in the immediate neighbourhood of masses of the Hœmatite iron ore.

It is a singular coincidence, that the largest Iron Master in this district, and consequently in Europe, and consequently in the the world, has fixed his retired residence on the very spot above described, as affording such indubitable proof of

"Where the haughty Roman stood."

The Castle, Park and Domain of Hensol, the Baronial Mansion of William Crawshay, Esq. (the sole proprietor of the princely Establishment of Cyfarthfa,) adjoin the grounds of Miskin. To the restless energy and spirit of Mr. Crawshay, and his immediate predecessors, and their hardly less spirited competitors and cotemporaries, (among whom, in justice, must be mentioned the names of Wilkinson, Hill, Homfray, and Guest, the latter gentleman being the present popular and highly respected Representative of the Borough of Merthyr Tydvil,) the Iron Trade of Great Britain is indebted for its present gigantic national importance. Although on the spot of his retirement, Mr. Crawshay may exult, as "*Stans super vias antiquas;*" yet, in his splendid establishment at Cyfarthfa, he has afforded proof that he has not been trammeled by "antiquated prejudices;" nor restrained from aiming at the "boldest novelties;" and, were the heap of slag or cinder in being now, I venture to affirm, he would not be long in exclaiming, and in suiting the action to the exclamation,—

"*Cedite, Romani!*"

## No. IV.

Rice Meyrick, of Cottrell, in his "Morgania Achaiographia," written in 1578, (the MS. is in the Library of Queen's College, Oxford,) writes thus: "Both soyles apt to nourish trees, whereof many in our days about Iron Milles were spoyled and consumed." Miles Bulton, who was Son-in-law, and Contemporary of Rice Meyrick, in his Memoranda speaks of "the Mines of Iron, Lead, Coal, &c." in the mountain districts, and in the vale. He adds, "there have been severall forestes and Woodes, tho' of late Years brought to destruction by the means of the severall Iron Milles, forges and furnaces there set up."

For this interesting note I am indebted to my very learned and estimable friend, the Rev. John Montgomery Traherne, whose rich store of topographical information, and antiquarian research, will not (I and others devoutly hope) be suffered to lie hid, and withheld from the public. His native county wants her history; who could so efficiently supply her want as he?

W. BIRD, PRINTER, CARDIFF.

# ERRATA.

Page 17, Note, for *Itui* read *Itur.*
18, line 2, for *in* read *into.*
19, — 4, for *Pontydyrau* read *Pontydryn.*
20, — 17, for *became* read *become.*
21, — last, for *seus* read *uses.*
26, — 17, for *fire* read *fuel.*
29, — 20, for *Hurst* read *Hunt.*
29, — last, for *resembles* read *resemble.*
30, — 17, for *&c.* read *Esq.*
32, — 12, for *require* read *acquire.*
36, — 4, for *could* read *would.*
37, — 22, for *strengh* read *strength.*